Selecting a Commercial Clinical Information System: An Academic Medical Center's Experience

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Abstract

Choosing a commercial clinical information system to meet the information needs of patient care, research, education, administration, finance, and ongoing changes of the healthcare system of an academic medical center is a challenging task. For the past six months, The Milton S. Hershey Medical Center undertook this task through (i) establishing a task force, (ii) assessing end-user information needs, (iii) understanding future institutional development and strategies, (iv) conceptualizing the ideal system, (v) identifying a short list of vendors, (vi) sending RFIs to vendors, (vii) visiting vendors' headquarters, (viii) technical review, (ix) reference calls, (x) using consultation services, (xi) on-site demonstration, and (xii) visiting the vendor's clients.

Introduction

The Study Group on Information Sciences of the Association of Academic Health Centers suggested that academic health centers may not be able to maintain their quality patient care, education, and research if integrated information systems are not implemented during the 1990s [1]. A recent study estimated that about 40 percent of existing hospitals will be out of business by the year of 2000 due to inefficiencies and the inability to compete [2]. For the past few years, many community hospitals and academic medical centers, which strive for survival and competitiveness, turn to clinical information management systems as one of many strategic measures [3, 4]. Zinn and DiGiulio have summarized the tangible qualitative and quantitative benefits of clinical information systems [5]. More importantly, use an integrated clinical information system properly could translate into financial gain and competitive advantage [4].

Choosing a commercial clinical information system for an academic medical center is a challenging task. The selected system has to meet the information needs of patient care, research, education, administration, finance, and ongoing changes in healthcare. In addition, many well developed clinical information systems are available in the current market. Each system has its strengths and weaknesses in terms of functionality, hardware and software architecture platforms, and uses of emerging technologies. Furthermore, commercial clinical information systems are costly.

The Milton S. Hershey Medical Center has committed to implement an integrated clinical information management system in the next two to three years. For the past six months, the Medical Center undertook a selection process and chose a commercial clinical information system.

Institutional Environment

The Penn State's Milton S. Hershey Medical Center, consisting of the University Hospital, Children's Hospital, and College of Medicine, is a 500-bed tertiary care teaching hospital and ambulatory care complex. Currently, there are several stand-alone clinical systems, including Clinical Laboratory, Pharmacy, and Radiology. There is no data exchange among these systems. All clinical patient data are communicated between departments by paper and managed manually. Although a fiber optic data backbone network exists throughout major campus buildings [6], there is no method for clinicians to review patient information and place orders on-line.

Overview of the Selection Process

Before undertaking the selection of a clinical information system, the Medical Center carefully considered previous experiences and advice of other institutions that had successfully selected and implemented clinical information systems [7 - 9].

Establishing a Task Force

A 24-member task force representing most end-user constituencies was established. The charge of the task force was to select a commercial clinical information system that will integrate with existing

departmental systems, provide on-line patient data review, allow physician order entry, and create a centralized clinical data repository. Table 1 shows the departments represented on the task force. The diverse background of the task force reflected the Medical Center's belief that the selected system would have to meet various demands. The task force members met every week for one to two hours to plan, discuss, and execute the selection process. Average attendance was about 75 percent.

Assessing End-User Information Needs

Identifying end-user information needs is a major determinant of success in implementing a new information system. Prior to the current task force, several individuals spent more than 100 hours to conduct an institutionwide end-user needs assessment [10]. The assessment revealed the needs of end-users in the following areas:

- patient data retrieval,
- order entry,
- nursing automation,
- a centralized clinical data repository, and
- a research data repository.

Understanding Future Institutional Development and Strategies

Understanding and incorporating future institutional development and strategies into the selection process will maximize the investment and benefits of the selected clinical information system. For instances, the following events are inevitable in the near future for the Medical Center:

- increase in outpatient volume,
- increase in off-site practice,
- tracking capitated patients' costs,
- analyzing contracts,
- performing case management,
- installing a wireless communication network, and
- using handheld devices to capture clinical data at points of need.

The system must accommodate such future information needs without major reconfiguration.

Conceptualizing the Ideal System

Once the current and future information needs were assessed, the task force conceptualized the ideal system that would match the requirements of the Medical Center. Such an ideal system would feature:

- open architecture,
- industry standards such as TCP/IP, SQL, and HL7,
- scalability in both hardware and software,
- fault tolerance,

Table 1

Departments with Which the CIS
Task Force Members are Associated

Admissions/Registration/Scheduling
Biostatistics and Epidemiology
Health Information Services
Hospital Administration
Hospital/Health Finance Management
Information Systems
Physicians from:
Anesthesia
Clinical Laboratory
Medicine
Pediatrics
Radiology
Rehabilitation
Surgery
Nursing Administration
Outpatient Services
Pharmacy Services
Professional Billing

- complex ad hoc query handling,
- acceptable response time,
- multi-platform workstations accessibility,
- data exchange with remote sites,
- multiple security levels,
- flexible tools for customization and development, and
- decision support capability.

These features were used as part of the evaluation criteria in the selection process.

Identifying a Short List of Vendors

To ensure an efficient and effective selection process, the task force focused on five outstanding vendors. This list of vendors was obtained through communications with colleagues and consultants, and observations of vendor demonstrations at conferences such as SCAMC and HIMSS.

Sending RFIs to Vendors

The five vendors were informed and a Request For Information (RFI) was sent to each vendor. The RFI served two main purposes − allow task force members to understand each system in detail and to provide a starting point for further investigations. The creation of the RFI was based on our conceptual ideal system and Campbell and his associates' suggestions [7]. In addition, a summary of the Medical Center was included in the RFI. The vendors were requested to limit their responses to 30 pages and return their responses in about six weeks.

Visiting Vendors' Headquarters

With the returned RFIs, there were still many unanswered questions about the vendors and their products. A group of task force members spent a full day in each vendor's headquarters to get acquainted with their products and leadership through personal contacts, presentations, and demonstrations. These vendor headquarters visits specifically emphasized the clinical evaluation criteria and vendor information in the RFI (see Table 2). The group used an assessment form, similar to Table 2, to comment and rate the vendors on a scale of 1 (low) to 5 (high).

The results of these visits were reported to the task force. On the basis of the RFIs and site visits, two out of five vendors were eliminated because they could not meet the identified criteria.

Technical Review

A team of technical task force members visited each of the remaining three vendors for two full days to develop an in-depth understanding of the hardware and software platforms, database management, interfacing with existing departmental systems, networking, flexibility for future modification and development, and planning and installation approaches. This review indicated that one of the three vendors was slightly preferable to the other two, but all three were feasible from a purely technical perspective.

Reference Calls

Meanwhile, several task force members conducted telephone interviews of four to five clients of each vendor. The survey was based on the reference call questions suggested by Campbell et al. [7], with emphases on vendors' services and support, customer satisfaction, implementation problems, and system integration.

The survey results revealed that all except two clients would recommend their vendors to others. In addition, all interviewed clients expressed a certain degree of dissatisfaction in services and support, especially the clients of fast-growing vendors. On the other hand, clients having partnerships with their vendors expressed higher satisfaction. Most clients expressed moderate satisfaction with their implementation processes and the integration of their legacy systems and the newly installed systems.

Based on the technical review and reference calls, the task force had placed one of the three vendors on indefinite hold.

Using Consultation Services

Seeking outside help was another measure of the task force to ensure an unbiased selection. For a minimal fee, the task force obtained vendor profiles compiled by an independent consultant. Each vendor profile included product descriptions, company

Table 2

An Outline of Request for Information

Clinical Evaluation Criteria
Review of patient information
Order communication
Source data capture
Confidentiality and security
Other resources to support patient care
Secondary uses of clinical data
Multi-function clinical workstation
Maximizing system availability and benefits
Exchange of data with remote sites
Technical Evaluation Criteria
Networking
Database
System management
Interfacing with other systems
Local enhancements and extensions of system functions
Vendor Information
Company history
Product information
Product use
Product sales
Key competitive features
Approach to installing products
Clients' input into product development
Future product plans
Clients list
Proposed cost

history, strengths and weaknesses, system pricing, assessment, and references. These documents were used as supplementary information to the task force.

On-Site Demonstration

The task force invited each of the remaining two vendors to the Medical Center for a three-day on-site demonstration. These demonstrations were conducted about three weeks apart. Each vendor scheduled ten different demonstration sessions with different emphases for top leadership, departmental administrators, task force members, nurses, physicians, and general audiences. All sessions included a basic demonstration of the proposed system. The purposes of these demonstrations were to (i) allow the task force members who had not seen the systems before to evaluate each system firsthand; (ii) let the top management and departmental administrators understand what could be expected from the selected system; and (iii) educate the end-users about the objectives, capabilities, and usefulness of clinical information systems. Participants were asked to rate the systems on a scale of 1 (low) to 5 (high) in the following categories:

- overall impression,
- patient information review,
- nursing care,
- physician order entry,
- registration and scheduling,
- response time, user-friendliness, and
- usefulness to your work.

Overall, both systems were well received by the participants and scored 4 or above in all but two categories (nursing care, and registration and scheduling). The on-site demonstration also provided the task force an opportunity to compare the two systems very closely and understand the responses from end-users.

Visiting the Vendors' Clients

A group of task force members spent a full day at live installation sites to learn about the approaches, experiences, and problems of its planning, implementation, and operation of the clinical information system. These sites were chosen because of their similarity to the Medical Center in size, practice environment, and installed systems.

Final Decision

Based on all the evaluation criteria, the responses from RFIs, series of demonstrations, and all available information, one of the two vendors was chosen by task force members through secret ballots to implement an integrated clinical information system for the Medical Center.

Discussions

The Medical Center will start to implement an integrated clinical information system within six months of contract negotiation. A critical element in the success of the selection process was the strong support from both the top leadership and end-users institutionwide. As a result, the task force members were able to make a well informed and carefully considered judgment. On the other hand, the process was time-consuming and expensive. A physician spent 50 percent of his time to guide, coordinate, and implement the process. Additionally, about 950 person-hours were spent in meetings, and 148 person-days and $50,000 on traveling. Although this selection process might be unique to the Medical Center, there were a few lessons worth mentioning.

Not one system in the market will exactly match the information needs of an institution. Future in-house customization and development of the selected system are necessary. Consequently, the task force closely examined each product's application development tools and flexibility.

The selection process was quite complex due to the many factors considered and the sheer volume of information collected for each vendor. It was very difficult to determine which factors were most important during the final decision process. Therefore, prioritization of these factors at an early stage of the search process, based on the institution's needs, is helpful. The tremendous amount of vendor information caused confusion among task force members. Since the task force members were volunteers with busy work schedules, they were overwhelmed by all the information collected for each vendor. To address this, a summary of the vendors and their products was presented to the task force before the final decision was made. Other alternatives to avoid information overload may include cutting down the number of vendors to two quickly and keeping the search period as short as possible.

Each vendor has strengths in certain products and weaknesses in others. For instance, a vendor may have a good order entry module but not a nursing care system; whereas another vendor has a good nursing care system but not an order entry module. Defining the requirements and priorities of the system well at the beginning and focusing on it throughout the selection process will help to differentiate multiple systems.

Creating a long term, mutually beneficial partnership with the chosen vendor is important. Examples of such a partnership include: developing new products together, being an alpha or a beta site for the vendor's new product(s), and being a showcase or a visiting site of the vendor. Clients of different vendors claimed that many benefits could be achieved through a good partnership. These benefits included receiving preferential services and support, free products, and substantial discounts on new products.

Finally, documenting in the contract the required services and support from the vendor during and after the implementation of the CIS was consistently advised during the reference calls.

Acknowledgment

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